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(54) Currency handling system

(57) A currency handling system includes a currency storage cassette (12), an account machine (10) and a transaction machine (18). The currency storage cassette is set in the account machine to load currency therein, and the cassette is then moved into the transaction machine to dispense the currency to customers. Any currency remaining in the cassette subsequent to the transaction is automatically removed and counted to verify the amount dispensed.

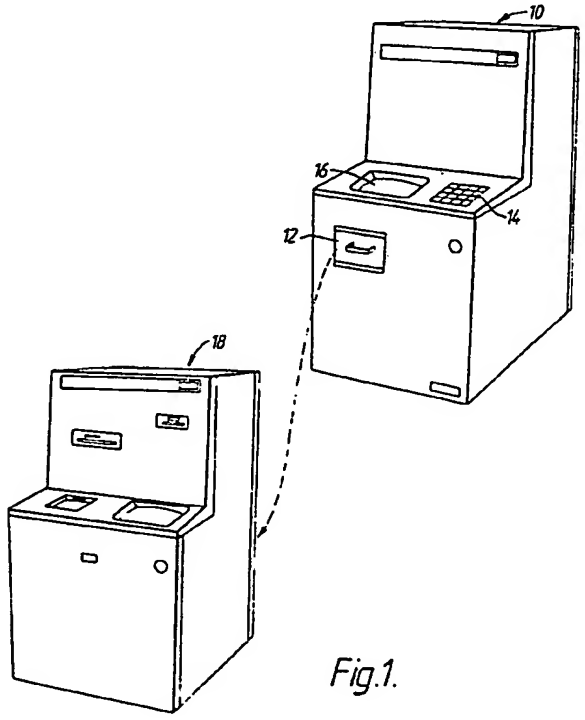

Fig.1.

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

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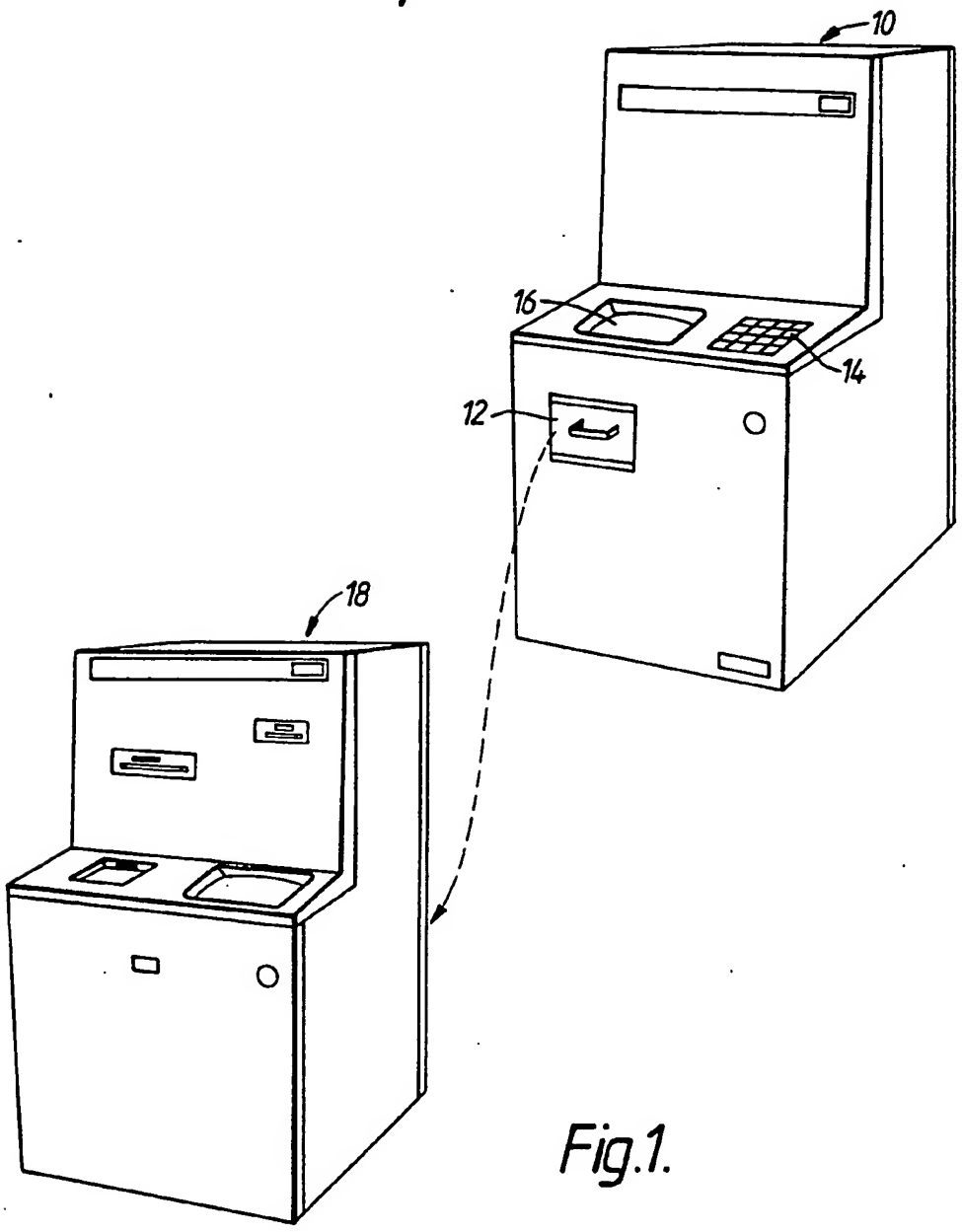

Fig.1.

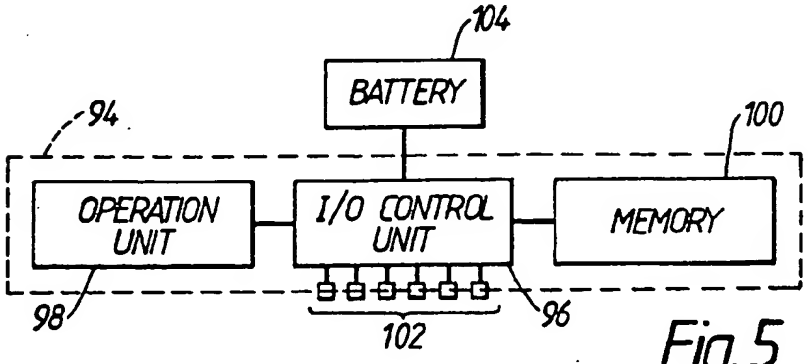

Fig.5.

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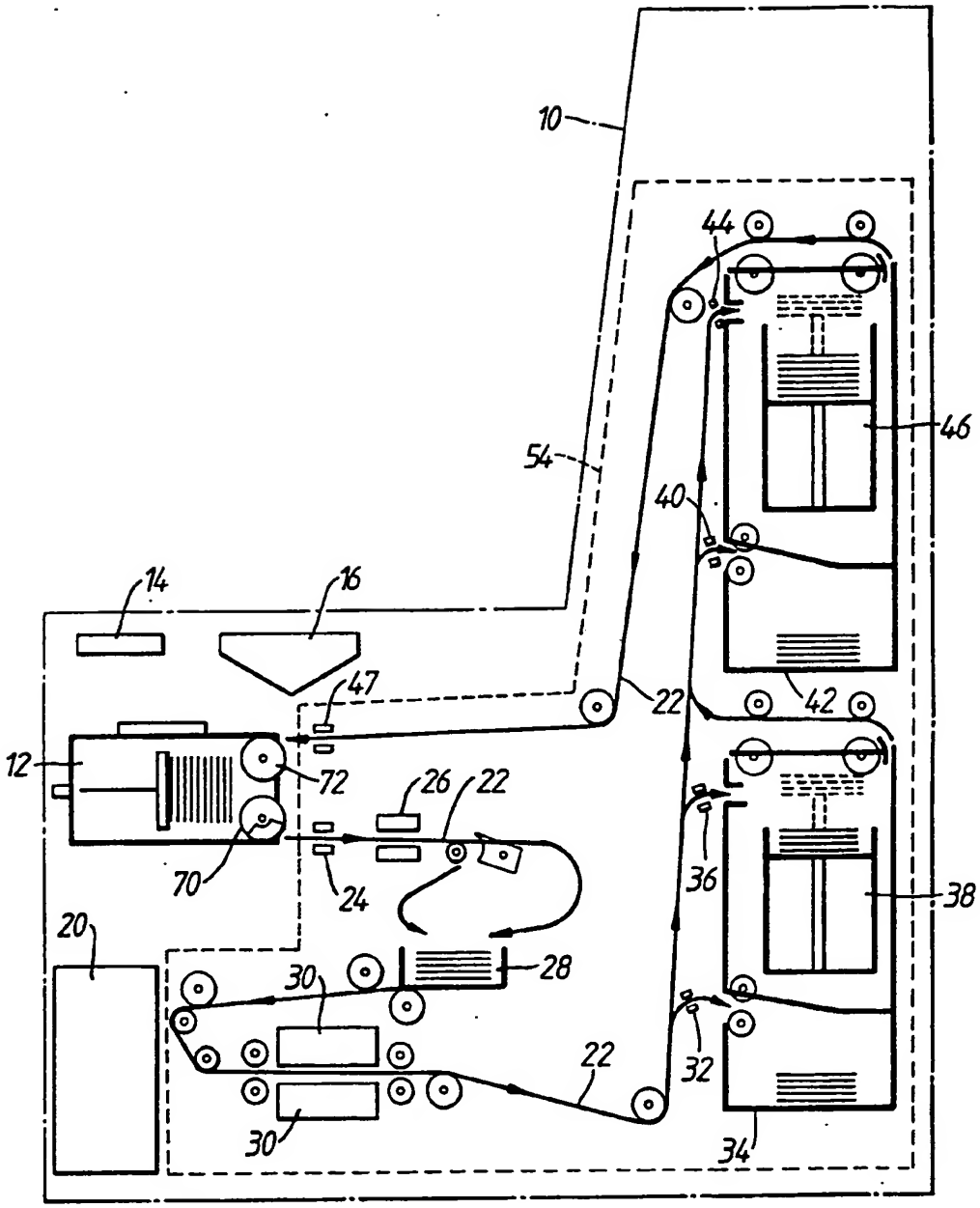

Fig. 2.

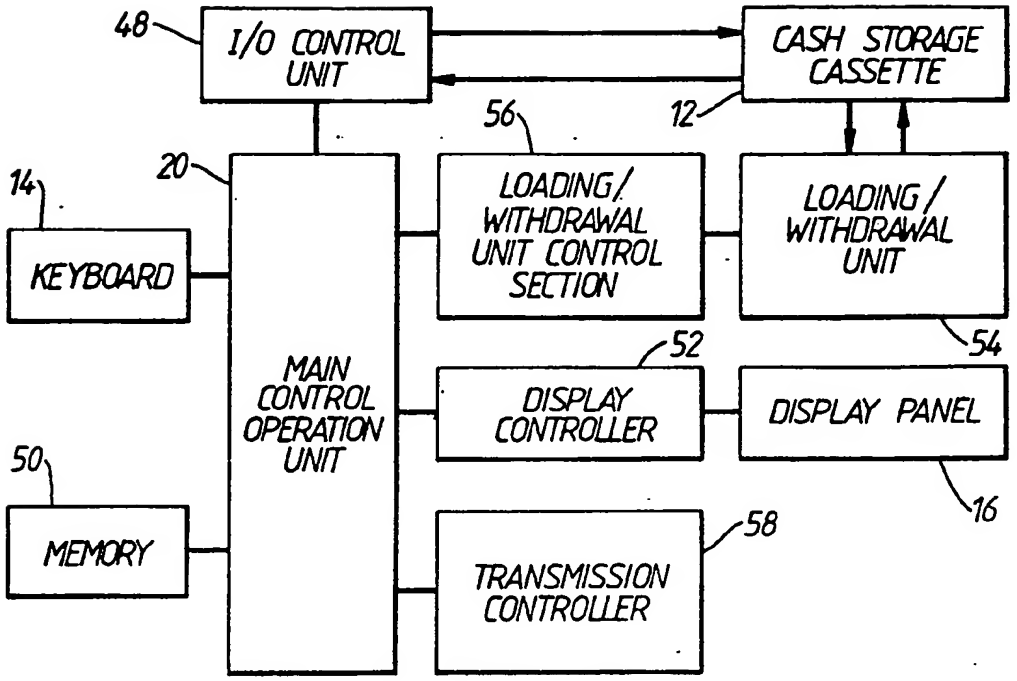
48
I/O CONTROL UNIT
CASH STORAGE CASSETTE
12
56
20
14
KEYBOARD
MAIN CONTROL OPERATION UNIT
LOADING/ WITHDRAWAL UNIT CONTROL SECTION
LOADING/ WITHDRAWAL UNIT
54
52
DISPLAY CONTROLLER
DISPLAY PANEL
16
50
MEMORY
58
TRANSMISSION CONTROLLER

Fig.3.

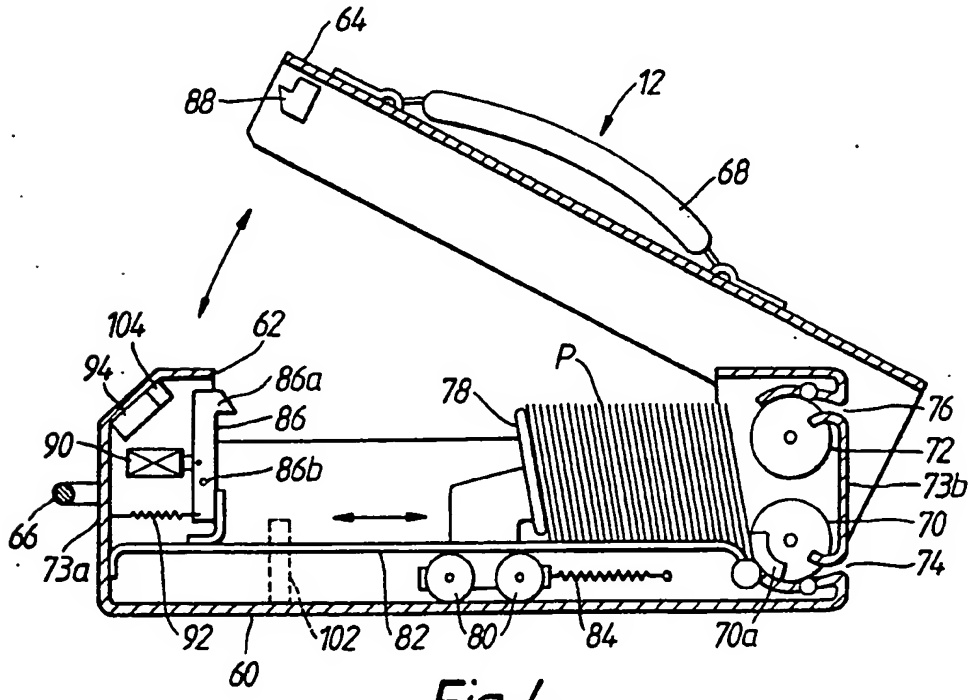
64
88
12
68
104
62
94
86a
86
90
86b
66
73a
92
60
102
82
80
84
70a
78
P
76
72
73b
70
74

Fig.4.

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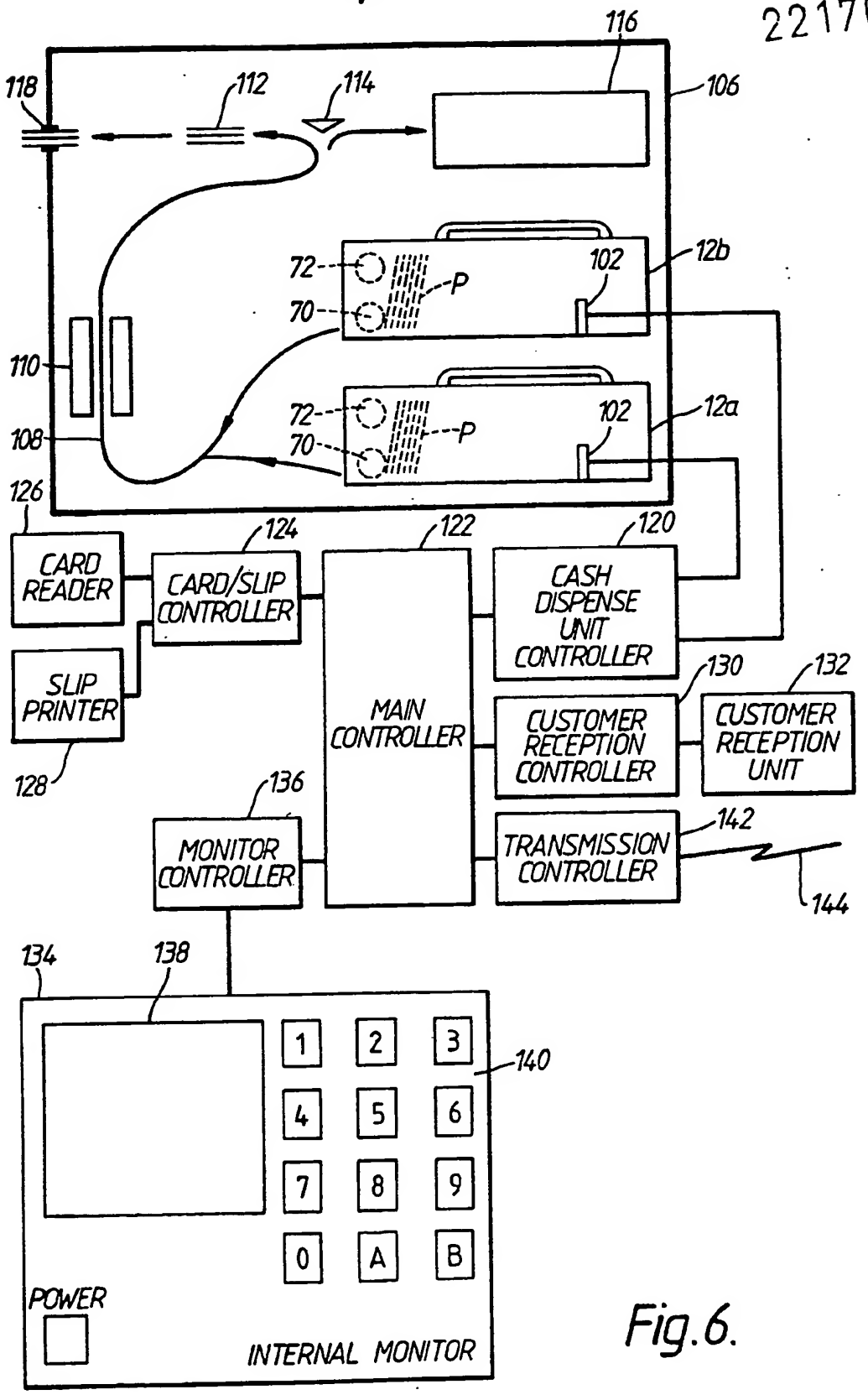

Fig.6.

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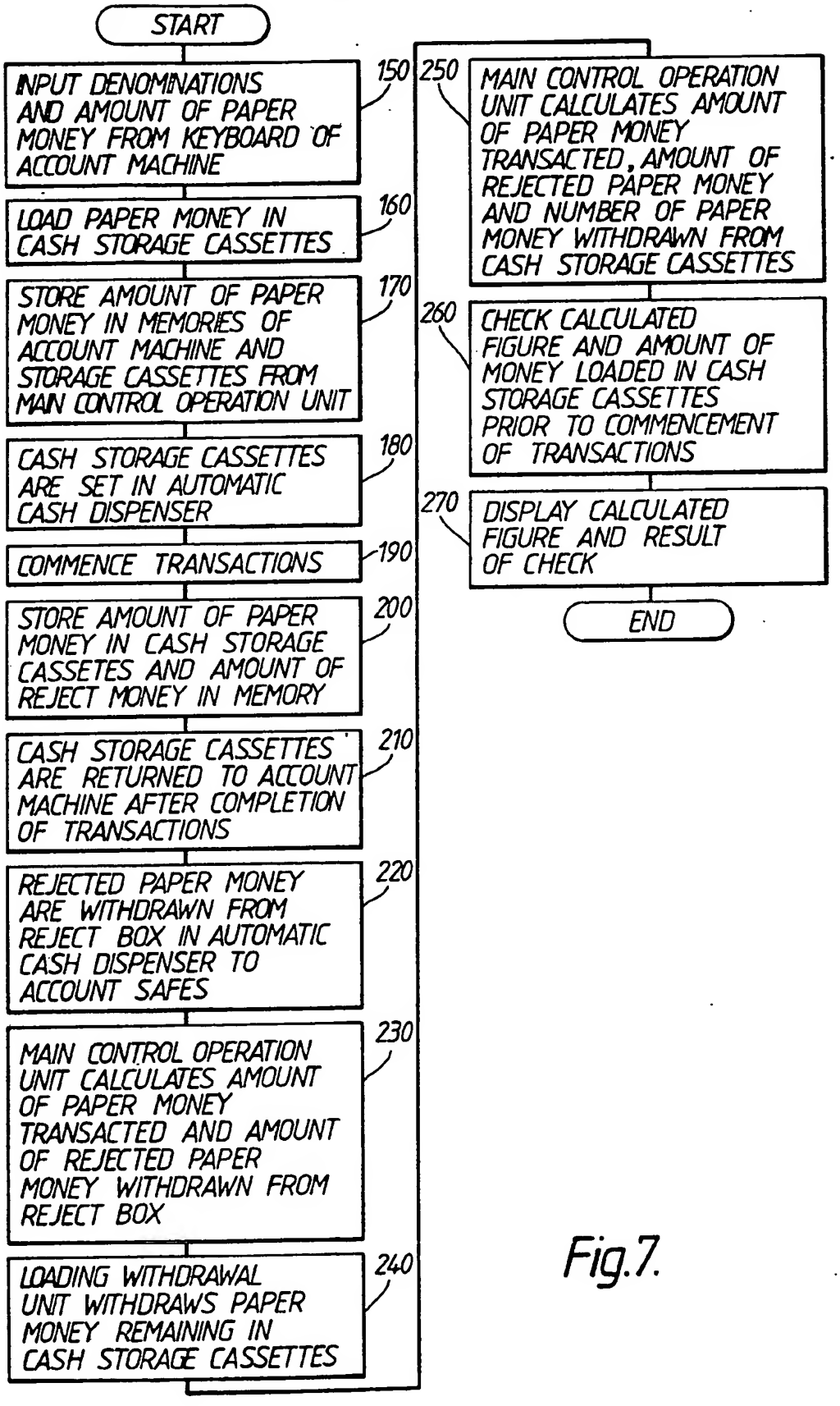

Fig.7.

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CURRENCY HANDLING SYSTEM

The present invention relates to a currency handling system used in, for instance, city banks.

Japanese Laid-Open Patent Application 61-229181 discloses a cash storage cassette which controls the paper money contained in the cash storage cassette. The cash storage cassette is used in an automatic cash dispenser or an automatic teller machine. The cash storage cassette comprises a box-shaped housing, a cover openably mounted on the housing, a take out roller mounted in the housing for taking contained paper money outside of the housing, a keyboard provided on the housing for inputting the amount of contained paper money, a display panel to display the amount keyed-in through the keyboard, and a control section including a memory, which is operatively connected to the keyboard, and a display panel provided on the housing.

An operator loads paper money in to this cash storage cassette and keys-in through the keyboard the amount of paper money contained in the cassette. The input amount of paper money is displayed on the display panel and, at the same time, is stored in the memory of the control section. The cash storage cassette in which the paper money is contained is set in a cash dispense unit of the automatic cash dispenser or the automatic teller machine. Then, the automatic cash dispenser or the automatic teller machine in

which the cash storage cassette has been set, is in the operation state for transaction with customers. After the completion of transactions, the operator calculates the amount of paper money remaining in the cash storage cassette, the amount of paper money dispensed in the transactions and the amount of paper money previously contained in the cash storage cassette. In this way, the paper money is controlled by the cash storage cassette itself.

In the above-mentioned cash storage cassette, the storage of paper money, the keying-in of the amount of paper money contained in the cassette and the withdrawal of the paper money remaining in the cassette after the completion of transaction are carried out by the operations of an operator. For this reason, the operator is largely responsible for these operations and, moreover, there is a risk of input errors arising.

It is an object of the present invention to provide a currency handling system which controls the withdrawal of currency into a safe from a cash storage cassette, and the loading of currency from the safe to the cash storage cassette rapidly and accurately.

According to the present invention, the currency handling system comprises cassette means for containing currency therein, means for loading designated amount of currency in the cassette means, memory means for storing the amount of currency loaded in the cassette means, transaction means for dispensing the currency from the cassette means,

means for withdrawing currency remained in the cassette means after dispensing by the transaction means, and means for counting the amount of currency withdrawn by the withdrawing means.

FIGURE 1 is a perspective view showing a currency handling system according to the present invention;

FIGURE 2 is a diagram showing an account machine used in the currency handling system of the present invention;

FIGURE 3 is a block diagram showing a control circuit of the account machine shown in FIGURE 2;

FIGURE 4 is a sectional view showing a cash storage cassette used in the currency handling system of the present invention;

FIGURE 5 is a block diagram showing an electric circuit installed in the cash storage cassette shown in FIGURE 4;

FIGURE 6 is a block diagram showing a cash dispense unit, a control circuit and a monitor panel of an automatic cash dispenser used in the currency handling system of the present invention; and

FIGURE 7 is a flow chart showing an operation of the currency handling system according to the present invention.

A preferred embodiment of the present invention will now be described with reference to FIGURES 1 to 7. FIGURE 1 is a perspective view showing a currency handling system of the present invention. An account machine 10 used for controlling a large amount of paper money, includes a cash

storage cassette 12, a keyboard 14 for inputting the designated amount of paper money to be contained in cash storage cassette 12, and a display panel 16 which displays the amount input to keyboard 14. Cash storage cassette 12, which contains a large amount of paper money is detachably set in account machine 10. Cash storage cassette 12 which was loaded with a large number of paper money in account machine 10 is set into a cash dispenser 18. Cash dispenser 18 carrys out dispensing of paper money automatically taken out from cash storage cassette 12 for customers when transactions are commenced. When the transactions are completed, cash storage cassette 12 is returned to account machine 10. This may be done manually, or automatically by a transport mechanism (not shown).

FIGURE 2 shows a construction of account machine 10. Cash storage cassette 12 in which a take-out roller 70 and a take-in roller 72 are rotatably mounted, is set at the center of a front portion of account machine 10. Keyboard 14 which designates the amount of paper money P to be contained in cash storage cassette 12, and display panel 16 which displays the amount designated are provided above cash storage cassette 12. A main controller/operating unit 20 is arranged in the lower part of the front of account machine 10 for controlling various operations, such as the taking in paper money P into cash storage cassette 12, taking out paper money P from cash storage cassette 12, and the display of the amount of paper money P taken into cash storage cassette 12 on display panel 16.

Paper money P taken out from cash storage cassette 12 is transported by a transport path 22 which runs around the

entire account machine 10. Transport path 22 starts from cash storage cassette 12 and returns to cash storage cassette 12. Along transport path 22, a first detector 24, a first discriminator 26, a temporary stacker 28, a second discriminator 30, a second detector 32, a damaged 1,000 Yen stacker 34, a third detector 36, a 1,000 Yen account safe 38; a fourth detector 40, a damaged 10,000 Yen stacker 42, a fifth detector 44, a 10,000 Yen account safe 46, and a sixth detector 47 are successively arranged.

Paper money P taken out from cash storage cassette 12 is detected by first detector 24. The main controller/operating unit 20 counts the amount of paper money P taken out from cash storage cassette 12 in accordance with the detection signal from first detector 24 and stores the count value of the paper money in a memory 50 (described later). The count value of the paper money is also stored in a memory 100 (described later) provided in cash storage cassette 12. Paper money P taken in damaged 1,000 Yen stacker 34 is detected by second detector 32. The main controller/operating unit 20 counts the amount of paper money P taken in damaged 1,000 Yen stacker 34 in accordance with the detection signal from second detector 32 and stores the count value of the paper money in memory 50. Paper money P taken in 1,000 Yen account safe 38 is detected by third detector 36. The main controller/operating unit 20 counts the amount of paper money P taken in 1,000 Yen account safe 38 in accordance with the detection signal from third detector 36 and stores the count value of the paper money in memory50. Paper money P taken in damaged 10,000 Yen stacker 42 is detected by fourth detector 40. The main

controller/operating unit 20 counts the amount of paper money P taken in damaged 10,000 Yen stacker 42 in accordance with the detection signal from fourth detector 40 and stores the count value of the paper money in memory 50. Paper money P taken in 10,000 Yen account safe 46 is detected by fifth detector 44. The main controller/operating unit 20 counts the amount of paper money P taken in 10,000 Yen account safe 46 in accordance with the detection signal from fifth detector 44 and stores the count value of the paper money in memory 50. Paper money P taken in cash storage cassette 12 is detected by sixth detector 47. The main controller/operating unit 20 counts the amount of paper money P taken in cash storage cassette 12 in accordance with the detection signal from sixth detector 47 and stores the count value of the paper money in memory 50. The count value of the paper money is also stored in memory 100 provided in cash storage cassette 12.

Paper money P taken out from cash storage cassette 12 passes through first discriminator 26 to discriminate between the front and back of each paper money. After discrimination of fronts and backs, paper money P is stacked temporarily in temporary stacker 28 with the fronts uppermost. Second discriminator 30 is arranged on both sides of transport path 22 in the vicinity of main controller/operating unit 20. Second discriminator 30 identifies damaged paper money transported from temporary stacker 28. Paper money P which has been identified by second discriminator 30 is stacked in one of damaged 1,000 Yen stacker 34, 1,000 Yen account safe 38, or damaged 10,000 Yen stacker 42 and 10,000 Yen account safe 46 in accordance

with the result of the discrimination by second discriminator 30. When damaged 1,000 Yen paper money is detected by second discriminator 30, the damaged 1,000 Yen paper money is stacked in damaged 1,000 Yen stacker 34. Normal 1,000 Yen paper money is stacked in 1,000 Yen account safe 38 when non-damaged 1,000 Yen paper money is detected by second discriminator 30. When damaged 10,000 Yen paper money is detected by second discriminator 30, the damaged 10,000 Yen paper money is stacked in damaged 10,000 Yen stacker 42. Normal 10,000 Yen paper money is stacked in 10,000 Yen account safe 46 when non-damaged 10,000 Yen paper money is detected by second discriminator 30.

FIGURE 3 is a block diagram showing a control circuit of account machine 10 described in FIGURE 2. When cash storage cassette 12 is set in account machine 10, main controller/operating unit 20 obtains the amount of paper money P contained in cash storage cassette 12 through an input/output control unit 48 and stores the amount in a memory 50. If the operator inputs the amount of paper money to be contained in cash storage cassette 12 from keyboard 14, main controller/operating unit 20 displays the amount of paper money on display panel 16 through a display controller 52. After display, main controller/operating unit 20 controls a loading/withdrawal unit 54 through a loading/withdrawal unit control section 56 to load the designated amount of paper money P into cash storage cassette 12 from 1,000 Yen account safe 38 or 10,000 Yen account safe 42. After that, cash storage cassette 12 is set in cash dispenser 18 to allow for transactions by cash dispenser 18.

When the transactions by cash dispenser 18 are completed, cash storage cassette 12 is returned to account machine 10 from cash dispenser 18. Main controller/operating unit 20 controls loading/withdrawal unit 54 through loading/withdrawal unit control section 56 to withdraw any paper money P remaining in cash storage cassette 12 into 1,000 Yen account safe 38 or 10,000 Yen account safe 42. After the withdrawal of the paper money, main controller/operating unit 20 calculates the amount of paper money P withdrawn from cash storage cassette 12 and the amount of rejected paper money in a reject box 116 (described later) of cash dispenser 18 input into keyboard 14 by an operator. Main controller/operating unit 20 carries out the calculation by reading out from memory 50 the amount of paper money P contained in cash storage cassette 12 beforehand. The result of the calculation is transmitted to a host computer (not shown) via a transmission controller 58.

Since, by this means, the loading and withdrawing of paper money P to cash storage cassette 12 can be carried out without manual operation by the operator, operation errors in the loading and withdrawal operations can be prevented.

FIGURE 4 shows a construction of cash storage cassette 12. A box body 60 has a space inside in which paper money P is contained. An opening 62 is formed at the top of box body 60 to allow insertion of paper money P therethrough. At the top of box body 60, a lid 64 is pivotally mounted, which can open and shut opening 62. On the outer surface of a front wall 73a and on the upper surface of lid 64,

handles 66 and 68 are respectively mounted to carry the box body 60. A take-out roller 70 having a rubber portion 70a is rotatably provided inside the rear of box body 60 to be driven and rotated by a drive mechanism (not shown) provided in account machine 10 or cash dispenser 18. An exit opening 74 is formed in a rear wall 73b opposite take-out roller 70. When this take-out roller 70 is rotated, paper money P contained in box body 60 is taken out by the friction engagement of a rubber portion 70a, and is dispensed to the outside through exit opening 74. Above the take-out roller 70, a take-in roller 72 is provided to be driven and rotated by a drive mechanism provided in account machine 10. An entrance opening 76 is formed in rear wall 73b opposite take-in roller 72. When this take-in roller 72 is rotated, paper money P transported by transport path 22 from 1,000 Yen account safe 38 or 10,000 Yen account safe 46 is taken into box body 60 by the take-in roller 72 through entrance opening 76. A back-up plate 78 is displaceably mounted on a pair of rollers 80 in box body 60 along an inside plate 82. Back-up plate 78 is urged by a spring 84 to press paper money P on inside plate 82 located between back-up plate 78 and take-out roller 70. By this pressing, the lower end portion of a foremost paper money P is engaged with take-out roller 70 to be taken out by the roller 70. At the front portion in box body 60, a hook member 86 having a claw 86a at one end thereof is mounted for locking lid 64 with box body 60. Hook member 86 is swingable about a shaft pin 86b, and the other end of hook member 86 is urged towards the front of box body 60 by a spring 92 between the other end of hook member 86 and front wall 73a. A solenoid

90 connects with one end of hook member 86 to rotate swingably. At the front portion in lid 64 corresponding to hook member 86, a catching member 88 is mounted for locking with claw 86a of hook member 86.

FIGURE 5 shows an electric circuit installed in cash storage cassette 12. A controller 94 comprises an input/output control unit 96 to which are connected an operation unit 98 and a memory 100, these being made into an integrated circuit. A contact 102 mounted on an outer surface of the side wall of cash storage cassette 12 (shown in FIGURE 4), is connected to input/output control unit 96. A battery 104 supplies power to input/output control unit 96, operation unit 98 and memory 100. Controller 94 and battery 104 are mounted in box body 60 of cash storage cassette 12, as shown in FIGURE 4. When cash storage cassette 12 is set in account machine 10, contact 102 is electrically connected with the control circuit (shown in FIGURE 3) installed in account machine 10. If cash storage cassette 12 is set in cash dispenser 18, contact 102 is electrically connected with the control circuit (shown in FIGURE 6) installed in cash dispenser 18.

FIGURE 6 is a block diagram showing the control of cash dispenser 18 in which a pair of cash storage cassettes 12a and 12b are set. In a cash dispense unit 106, cash storage cassettes 12a and 12b are detachably installed. Cash storage cassettes 12a and 12b load 1,000 Yen paper money and 10,000 Yen paper money, respectively. Paper money P taken out from cassettes 12a and 12b is transported by transport path 108 and, on the way, passes through a discrimination section 110. When paper money P passes through

discrimination section 110, various detection procedures such as "skew of paper money", "thickness of paper money", "size of paper money", "magnetic pattern" and etc. are performed. According to these detection results, "normal/abnormal discrimination" is performed. The meaning of "abnormal discrimination" is that paper money P is determined to be false, overlapping paper money, a skewed paper money, or a damaged paper money. Normal paper money P is temporarily stacked in a temporary stacker 112, abnormal paper money P is led to a reject box 116 by a selector gate 114. When the designated amount of paper money P has been temporarily stacked in temporary stacker 112, it is released to a dispensing port 118.

A cash dispense unit controller 120 controls the operation described above and is connected to a main controller 122. Main controller 122 controls the whole cash dispenser 18. A card reader 126 and a slip printer 128 are connected to main controller 122 via a card/slip controller 124. A customer reception unit 132 is also connected to main controller 122 via a customer reception controller 130. A monitor panel 134 is further connected to main controller 122 via a monitor controller 136. Monitor panel 134 comprises a display 138 such as a liquid crystal character display, and a keyboard 140. Monitor panel 134 has the function of opening and closing transactions of the cash dispenser 18 by the operation of the operator. Display 138 of monitor panel 134 informs the operator of the occurrence of a fault or when the machine is empty. Main controller 122 is connected to a host computer (not shown), as a deposit ledger, via a transmission controller 142 and a

communication line 144.

The operation of this embodiment is described referring the process flow-chart in FIGURE 7. At the start of transactions, the operator sets cash storage cassette 12a into account machine 10 after supplying power to account machine 10 and cash dispenser 18. After setting of cash storage cassette 12a, the operator inputs the denomination (1,000 Yen) and amount of paper money P to be contained in cash storage cassette 12a into keyboard 14 of account machine 10. Depending on the amount of paper moneyP input, main controller/operating unit 20 controls loading/withdrawal unit 54 via loading/withdrawal unit control section 56 to load the amount of paper money P input by the operator into cash storage cassette 12a from 1,000 Yen account safe 38. In this time, the actual value of contained paper money P, which is counted by the detection of sixth detector 47, in cash storage cassette 12 is stored in memory 50 provided in account machine 10 and in memory 100 provided in cash storage cassette 12. The operation of loading paper money P (10,000 Yen) in cash storage cassette 12b is performed the same as above (Steps 150-170).

Next, the operator takes cash storage cassettes 12a and 12b from account machine 10 and sets them into cash dispense unit 106 of cash dispenser 18. After this setting, transactions are commenced for customers (Steps 180-190).

When an amount of the paper money desired by a customer is input from a keyboard (not shown) of cash dispenser 18, main controller 122 controls cash dispense unit 106 via cash dispense unit controller 120 to take out paper money P equivalent to the desired amount

from cash storage cassettes 12a and 12b. Taken out paper money P from cassettes 12a and 12b is dispensed from dispensing port 118 via transport path 108. The amount of paper money P dispensed from dispensing port 118 and stored in reject box 116 is stored in memory 100 of each cash storage cassettes 12a and 12b by control of main controller 122 via contact 102 and input/output control unit 96. The above operations are carried out during transactions. When the transactions for customers are completed, the operator removes cash storage cassettes 12a and 12b from cash dispense unit 106 of cash dispenser 18. Then, the operator sets cash storage cassettes 12a and 12b into account machine 10 (Steps 200-210).

When cash storage cassettes 12a and 12b are set again into account machine 10, main controller/operating unit 20 of account machine 10 calculates the amount of paper money P stored in reject box 116 of cash dispenser 18 and the amount of dispensed paper money P from memory 100 of each cash storage cassette 12a and 12b. After calculation, main controller/operating unit 20 controls withdrawl of the money remaining in cash storage cassettes 12a and 12b into loading/withdrawal unit 54, including 1,000 Yen account safe 38, damaged 1,000 Yen stacker 34, 10,000 Yen account safe 46 and damaged 10,000 Yen stacker 42 via transport path 22. The amount of paper money P withdrawn into loading/withdrawal unit 54 is stored in memory 50 of account machine 10. When withdrawal is completed, main controller/operating unit 20 calculates the amount of paper money P transacted and stored in memory 100, the amount of paper money P stored in reject box 116 and the amount of

paper money P withdrawn from cash storage cassettes 12a and 12b and stored in memory 50. Main controller/operating unit 20 checks the calculation by collating the calculated figure and amount of paper money P contained in cash storage cassettes 12a and 12b prior to the commencement of transactions. Main controller/operating unit 20 displays the calculated figure and the result of the check on display panel 16 via display controller 52 (Steps 220-270).

Accordingly, the loading and withdrawing of paper money P for cash storage cassette 12 by the operator can be simplified compared with the conventional method. Thus the accuracy of operation for loading and withdrawal can be improved.

As described above, a designated amount of currency such as paper money is loaded into a cash storage cassette from an account safe prior to transactions and the amount of currency contained is calculated. Currency remaining in the cash storage cassette after the completion of the transactions is withdrawn in the account safe and the amount of currency withdrawn is calculated. Therefore, the operation of withdrawing currency from the cash storage cassette into the account safe, and loading currency from the account safe into the cash storage cassette can be carried out with rapidity and accuracy.

This embodiment of the present invention is not limited to cash dispenser 18, and can be applied to the other automatic transaction machines such as cash dispense/deposit machines, called automatic teller machines. Further, in the above embodiment, the case of application to the cash storage cassette which load paper money has been described.

However, the present invention can also be applied to the case of a cash storage cassette which loads coins. Also, the account safe and dispensing machine may be combined into a single machine.

Numerous modifications and variations of the present invention are possible in light of the above teachings. It is therefore to be understood that, within the scope of the appended claims, the present invention can be practiced in a manner other than as specifically described herein.

WHAT IS CLAIMED IS:

1. A currency handling system comprising:

cassette means for storing currency therein;

means for automatically loading a designated amount of currency into the cassette means;

memory means for storing start data corresponding to the amount of currency loaded into the cassette means;

transaction means for automatically and controllably dispensing at least a portion of the currency from the cassette means;

means for automatically removing from the cassette means any currency remaining in the cassette means after dispensing by the transaction means; and

means for automatically counting the currency removed by the removing means.

2. The system of claim 1 wherein the cassette means includes a box body having a space for containing currency therein.

3. The system of claim 2 wherein the memory means is mounted on the box body.

4. The system of claim 2 wherein the cassette means includes;

means for automatically feeding currency out of the cassette means; and

means for automatically receiving currency into the cassette means.

5. The system of claim 2 wherein each of the feeding means and the receiving means includes a rotatable roller.

6. A currency handling system comprising:

cassette means for storing currency therein;

an account machine for removably receiving the cassette means, the account machine including at least one account safe for storing currency therein, and means for loading a designated amount of currency from the account safe into the cassette means;

first memory means for storing start data corresponding to the amount of currency loaded in the cassette means;

a transaction machine removably supporting the cassette means for dispensing currency loaded by the loading means from the cassette means;

second memory means for storing transaction data corresponding to the amount of currency dispensed from the cassette means;

means in the account machine for removing from the cassette means any currency remaining in the cassette means and transporting the remaining currency to the account safe after the dispensing by the transaction machine;

third memory means for storing balance data corresponding to the amount of currency removed from the cassette means and transported to the account safe; and

means for automatically verifying the currency of the transaction data, the start data and the balance data.

7. The system of claim 6 wherein the cassette means

includes;

means for automatically feeding currency out of the cassette means; and

means for automatically receiving currency into the cassette means.

8. The system of claim 7 wherein the loading means includes a first transport path for connecting the account safe with the receiving means of the cassette means when the cassette means is received in the account machine.

9. The system of claim 8 wherein the removing means includes a second transport path for connecting the account safe and the feeding means of the cassette means when the cassette means is received in the account machine.

10. The system of claim 6 wherein the first memory means is in the account machine.

11. The system of claim 10 wherein the second memory means is in the cassette means.

12. The system of claim 11 wherein the cassette means includes means for electrically communicating with the account machine to supply the transaction data stored in the second memory to the verifying means.

13. The system of claim 12 wherein the third memory means is in the account machine.

14. A currency handling system substantially as hereinbefore described with reference to the accompanying drawings.

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